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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/772,825   | 02/05/2004  | Toshikazu Hirota     | 796_003 DIV1        | 6021             |
| 25191  | 7590        | 09/19/2005           |                     | EXAMINER         |
| BURR & BROWN<br>PO BOX 7068<br>SYRACUSE, NY 13261-7068 |             |                      | KIM, CHRISTOPHER S  |                  |
|  |             |                      | ART UNIT            | PAPER NUMBER     |
|  |             |                      | 3752                |                  |

DATE MAILED: 09/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                        |                     |  |
|------------------------------|------------------------|---------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b> | <b>Applicant(s)</b> |  |
|                              | 10/772,825             | HIROTA ET AL.       |  |
|                              | <b>Examiner</b>        | <b>Art Unit</b>     |  |
|                              | Christopher S. Kim     | 3752                |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 23 June 2005.
- 2a) This action is FINAL.                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 14 is/are pending in the application.
  - 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 14 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) All    b) Some \* c) None of:
    1. Certified copies of the priority documents have been received.
    2. Certified copies of the priority documents have been received in Application No. 09/884,457.
    3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
 Paper No(s)/Mail Date \_\_\_\_\_
- 4) Interview Summary (PTO-413)  
 Paper No(s)/Mail Date. \_\_\_\_\_
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: \_\_\_\_\_

## DETAILED ACTION

### *Response to Amendment*

1. The response filed June 23, 2005 is acknowledged.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### *Claim Objections*

3. Claim 14 is objected to because of the following informalities: in line 19, "said ejection side and portion" should read --said ejection side end portion-. Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

4. Claim 14 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 14 recites

actuating said piezoelectric/electrostrictive element so as to attain a rate of change per unit time in a ratio of an amount of change in a volume of said pressurizing chamber to a sum of a volume of said ejection nozzle and the volume of said pressurizing chamber of 6 ppm/μs to 40 ppm/μs

Similarly, paragraph 53 of the specification discloses

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The rate of change (per unit time) R in the ratio of the amount of change  $\Delta V$  in the volume of the pressurizing chamber 22 to the sum ( $V_n + V_k$ ) of the volume  $V_n$  of the ejection nozzle 24 and the volume  $V_k$  of the pressurizing chamber 22, ( $\Delta V/(V_n + V_k)$ ), must be 6 ppm/ $\mu s$  to 40 ppm/ $\mu s$ .

Parts per million (ppm) normally represents a unit of measurement for concentration.

The specification fails to teach how "ppm" represents a rate of change. The expression  $\Delta V/(V_n + V_k)$  would appear to result in a unitless number. Even if  $\Delta V$  is expressed per unit time, the expression would result in a time unit raised to the negative one.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 14 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Based on applicant's argument, it is uncertain what is being defined by "ppm."

Applicant asserts that "ppm" is not a "parts per million" concentration unit but rather 1/1,000,000. By definition, "ppm" means "parts per million" concentration. In the case of claim 14, part "an amount of change in volume of said pressurizing chamber" per million part "sum of a volume of said ejection nozzle and said volume of said pressurizing chamber."

Additionally, claim 14 recites "rate of change per unit time expressed as a ratio...is in a range of 6 ppm/ $\mu s$  to 40 ppm/ $\mu s$ ." Rate of change per unit time expresses a second order change with respect to time. For example, velocity is a rate of change and acceleration is a rate of change per unit time. While  $\mu s$  in the denominator express

"per unit time," ppm does not express a rate of change. Ppm/ $\mu$ s expresses the change in "parts per million" per unit time. It does not express the rate of change in "parts per million" per unit time.

***Claim Rejections - 35 USC § 103***

7. Claim 14 (as best understood) is rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi et al. (WO 00/01491).

Takeuchi discloses a method for ejecting liquid droplets by use of a liquid droplet ejection apparatus comprising: a pressure chamber 1; a liquid supply path 5; an ejection nozzle 2; and a piezoelectric/electrostrictive element 9. Takeuchi fails to disclose the ratio of diameter of the liquid introduction bore to the diameter of the ejection opening being 0.6 to 1.6 and the rate of change per unit time being 6ppm/ $\mu$ s to 40 ppm/ $\mu$ s. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have provided a ratio of diameter of the liquid introduction bore to the diameter of the ejection opening between 0.6 to 1.6 and the rate of change per unit time between 6ppm/ $\mu$ s to 40 ppm/ $\mu$ s, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

***Response to Arguments***

8. Applicant's arguments filed June 23, 2005 have been fully considered but they are not persuasive.

Applicant responds to the rejection under 35 U.S.C. 112, first paragraph by arguing that while technically the ratio of  $\Delta V/(V_n + V_k)$  is mathematically unitless, applicant's intent was to represent number that corresponds to a volume change amount that occurs over a designated period of time. Applicant should use sound mathematical expressions to express his intent. Applicant cannot unilaterally assert unsound or incorrect mathematical expressions.

In light of the rejections under 35 U.S.C. 112, first and second paragraphs, no response is given to applicant's arguments directed to the art rejection because the metes and bounds of the claimed invention cannot be determined. Applicant's argument is centered on the ratio of  $\Delta V/(V_n + V_k)$ . Takeuchi has been applied as best understood by the examiner.

### ***Conclusion***

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher S. Kim whose telephone number is (571) 272-4905. The examiner can normally be reached on Monday - Thursday, 6:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Scherbel can be reached on (571) 272-4919. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Christopher S. Kim  
Primary Examiner  
Art Unit 3752

CK